

# Application a

## Critical Thinking

Name \_\_\_\_\_ Answers \_\_\_\_\_

In Exercises 13–24, graph the system and describe its solution(s).

13.  $\begin{cases} x + y = 8 \\ x + y = -1 \end{cases}$  no Solution

14.  $\begin{cases} 3x - 2y = 0 \\ 3x - 2y = -4 \end{cases}$  no Solution

15.  $\begin{cases} 3x - 2y = 3 \\ -6x + 4y = -6 \end{cases}$  Infinite

16.  $\begin{cases} x - 3y = 2 \\ -2x + 6y = 2 \end{cases}$  no Solution

17.  $\begin{cases} 3x + 2y = 2 \\ 6x + 4y = 14 \end{cases}$  no Solution

18.  $\begin{cases} -3x + 10y = 15 \\ 3x - 10y = -15 \end{cases}$  Infinite

24. **Earnings** Suppose you have a job in an ice cream shop that pays \$6 per hour. You also have a babysitting job that pays \$4 per hour. You want to earn at least \$60 per week but would like to work no more than 12 hours per week.

- Graph and write a system of linear inequalities that describes this situation.
- Give three possible solutions to the system.

$x$  = hours ice cream  
 $y$  = hours babysitting

$$\begin{cases} 6x + 4y \geq 60 \\ x + y \leq 12 \\ x \geq 0 \quad y \geq 0 \end{cases}$$

Answers vary  
↓  
Shaded region of graph

44. There are 1170 students in a school. The ratio of girls to boys is 23 : 22. The system below describes relationships between the number of girls and the number of boys.

$$g + b = 1170 \quad \frac{g}{b} = \frac{23}{22}$$

$$g = \frac{23b}{22}$$

$$\frac{23b}{22} + b = 1170$$

598 girls

572 boys

- Solve the proportion for  $g$ .
- Solve the system.
- How many more girls are there than boys?

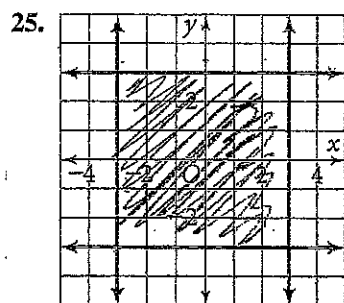
$$23b + 22b = 25740$$

$$45b = 25740$$

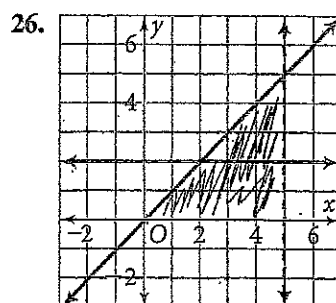
$$b = 572$$

$$g = 598$$

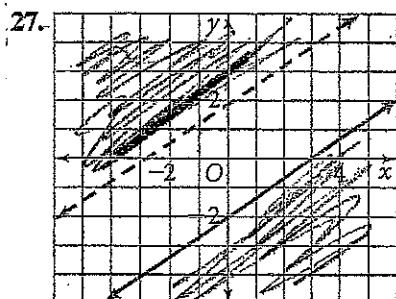
Write a system of inequalities for each of the following graphs.



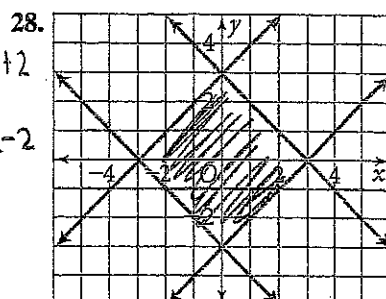
$$\begin{cases} y \leq 3 \\ y \geq -3 \\ x \leq 3 \\ x \geq -3 \end{cases}$$



$$\begin{cases} x < 5 \\ y > 0 \\ y \leq x \end{cases}$$



$$\begin{cases} y > \frac{2}{3}x + 12 \\ y < \frac{2}{3}x - 2 \end{cases}$$



$$\begin{cases} y \leq -x + 4 \\ y \leq x + 4 \\ y \geq x - 4 \\ y \geq -x - 4 \end{cases}$$

Solve each radical equation. Check your solution. If there is no solution, write no solution.

34.  $\sqrt{5x+10} = 5$

35.  $-6 - \sqrt{3y} = -3$

36.  $\sqrt{7p+5} = \sqrt{p-3}$

34.  $5x+10=25$

$5x=15$

$x=3$

35.  $-\sqrt{3y} = 3$

$\sqrt{3y} = -3$

$3y=9$

$y=3$

extraneous

NO solution

36.  $7p+5=p-3$

$6p=-8$

$p=-\frac{4}{3}$

NO solution

Solve each radical equation. Check your solution. If there is no solution, write no solution.

48.  $\sqrt{x^2-6x} = 4$

49.  $\sqrt{2x^2+8x} = x$

50.  $\sqrt{x^2+4x+5} = x$

51.  $x+3 = \sqrt{x^2-4x-1}$

50.  $x^2+4x+5=x^2$

$4x+5=0$

$4x=-5$

$x=-\frac{5}{4}$

NO solution

48.  $x^2-6x=16$

$x^2-6x-16=0$

$(x-8)(x+2)=0$

$x=8 \quad x=-2$

49.  $2x^2+8x=x^2$

$x^2+8x=0$

$x(x+8)=0$

$x=0 \quad x=-8$   
ext

51.  $x^2+6x+9=x^2-4x-1$

$6x+9=-4x-1$

$10x=-10$

$x=-1$

44. a. The equation  $v = 8\sqrt{h-2r}$  gives the velocity  $v$  in feet per second of a car at the top of the loop of a roller coaster. Find the radius of the loop when the hill is 150 ft high and the velocity of the car is 30 ft/s.

b. Find the approximate speed in mi/h for 30 ft/s. (Hint: 1 mi = 5280 ft)

c. **Critical Thinking** Would you expect the velocity of the car to increase or decrease as the radius of the loop increases? As the height of the hill decreases?

d. Explain your reasoning in your answer for part (c).

a.  $30 = 8\sqrt{150-2r}$

$3.75 = \sqrt{150-2r}$

$14.0625 = 150-2r$

$r = \frac{2175}{32} = 67.96875 \text{ ft}$

$-135.9375 = -2r$

$r =$

31. **Error Analysis** Beth is solving a system by elimination. Her work is shown below. What error did she make?

$$4x - 6y = 1 \longrightarrow 20x - 30y = 5$$

$$3x + 5y = -8 \longrightarrow 18x + 30y = -8$$

did not multiply by 6

39. **Critical Thinking** Find a value of  $n$  such that the  $x$ -value of the solution of the system at right is 4.

$$5x - 10y = 50$$

$$nx + 10y = 6$$

$$14x = 56$$

$$x = 4$$

$$5x + nx = 56$$

$$5x + nx = 14$$

$$\text{if } x = 4$$

$$5 + n = 14$$

$$\boxed{n = 9}$$

For Exercises 41–43, suppose you are solving a system of linear equations and get the given result. How many solutions must the system have?

41. a true statement, such as  $2 = 2$

42. a false statement, such as  $10 = 1$

43. a statement such as  $x = 4$

41. Infinite # solutions

43. One solution

42. no solution

**Open-Ended** Write a system of linear inequalities with the given characteristics.

38.  $(0, 0)$  is a solution.

39. Solutions are only in Quadrant II.

40. There is no solution.

41.  $(3, 7)$  is not a solution.

Answers  
very

**Solve by elimination.**

$$42. \left( \frac{6}{x} - \frac{4}{y} = -4 \right) 2$$

$$\frac{3}{x} + \frac{8}{y} = 3$$

$$\frac{12}{x} - \frac{8}{y} = -8$$

$$\frac{15}{x} = -5$$

$$15 = -5x$$

$$\boxed{-3 = x}$$

$$\frac{6}{x} - \frac{4}{y} = -4$$

$$-2 - \frac{4}{y} = -4$$

$$-\frac{4}{y} = -2$$

$$-4 = -2y$$

$$\boxed{y = 2}$$

